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# JOURNAL OF STUDENT RESEARCH

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**STOUT**  
WISCONSIN'S POLYTECHNIC UNIVERSITY



University of Wisconsin-Stout  
Journal of Student Research  
Volume XX, 2021-22



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**Peter Reim**

*Editor-in-Chief*

**Anne Hoeltke**

*Director: Office of Research and Sponsored Programs*

**Office of Research and Sponsored Programs**

University of Wisconsin-Stout

Robert S. Swanson Learning Center

Menomonie, WI 54751

(715) 232- 4042

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# Foreword

Dear Readers,

What you have before you at this moment is a significant achievement: this is Volume XX of UW-Stout's *Journal of Student Research (JSR)*. The *JSR* was first published May 1, 2002; at the time it signaled a fulfillment of Stout's e-scholar initiative because it was published in both print and online formats, recognizing the university's leadership in emerging technologies, including emerging communications media.

Of that first volume, then-Provost Dr. James Sedlak explained that he, the Chancellor, and the Vice Chancellor had sought to produce "a high quality work that focused on and recognized the research of graduate and undergraduate students" at UW-Stout. Dr. Sedlak then observed, "This publication has met that standard."

Twenty years later, the things we hoped would not change, have not. The *JSR* still appears in a quality print edition and maintains an accessible online presence as well. We still provide a fine platform for the distinctive research representing the many fields of study one will find on this campus. But some noteworthy things have changed: within a few years of inception, juried fine art also began to be featured, representing the explorations of students from the School of Art and Design; this feature continues to this day. More recently, the published work found here has become searchable through MINDS@UW. One can do a subject search of all volumes of the *JSR* by searching minds.wisconsin.edu or by using the QR code provided on page 5 of this edition.

It is clear from the first volume that the *JSR* had wonderful support from the administrators back in 2002. We are thankful that it still enjoys such support today. There is new leadership in the Office of Research and Sponsored Programs, where Anne Hoeltke and Chela Cea have provided energetic and visionary leadership in encouraging research activities at UW-Stout, including support for the *JSR*. We wish also to thank cover artist Krissy Pohlod; Charles Lume, who arranged for the juried art selections included in the *JSR*; and Chad Nyseth and the Graphic Communications Practicum, who are responsible for production.

We are pleased to present Volume XX of the *Journal of Student Research*. May it continue to celebrate our student research achievements!

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# **"My Scars are My Battle Wounds; I Made it Through": Non-Suicidal Self-Injury in a Gender Diverse College Population**

**Alexandria Cornella<sup>1</sup>**

Senior, B.S. Human Development and Family Studies

**Faculty Advisor: Dr. Candice Maier**

## **Abstract**

Non-suicidal self-injury (NSSI) on college campuses is frequent, with one in five college students having reported engaging in self-injury. The impacts of childhood trauma and abuse are believed to play a role in NSSI behavior and elevate risk factors for individuals in adulthood. The purpose of this study was to explore the experiences of gender diverse college-aged individuals who have engaged in NSSI. Results indicated that most of the participants reported trauma influenced their NSSI behavior. Though there was not a significant report of family-based trauma, it was found that the traumatic experience that most of the participants shared was having a traumatic sexual experience (59%  $n = 46$ ). Some clinical implications and directions for future research are discussed.

*Keywords:* non-suicidal self-injury, trauma, abuse, college populations, gender diverse

## **Introduction**

Non-suicidal self-injury (NSSI) is the deliberate act of harming oneself without the intent to die (Hall & Place, 2010; Nixon et al., 2002). Young adults who are college age may be at particular risk for NSSI (Chia et al., 2008; Kaniuka et al., 2020). Given the rise of NSSI in this population, it is imperative to understand and address factors that may contribute to NSSI in college students. Specifically, it has been documented that NSSI plays an important role in coping with trauma symptoms and that trauma symptoms may mediate the relationship between occurrence of traumatic events and NSSI (Smith, et al., 2013). The purpose of this paper is to explore the experiences of young adults who have reported NSSI as well as a history of traumatic events and their perceptions of family support. Based on previous research, it is expected that those individuals who report engaging in NSSI also report a traumatic event such as abuse or violence in their past. Thus, the research questions for this paper are, "Do young adults who engage in NSSI have trauma in their history?" and "What is the support system for young adults who engage in NSSI?"

## **Literature Review**

### **What is Non-Suicidal Self-Injury?**

NSSI is defined as the intentional destruction of one's body tissue without suicidal intent and for purposes not socially sanctioned (Klonsky et al., 2014). NSSI can occur in many ways but not limited to, cutting, burning, punching oneself, purposely breaking bones, and more. It is not the act that defines NSSI but the motivations behind it (Cornell University, n.d.). Specifically, NSSI has been associated with emotion regulation, self-punishment, and distress (Taylor et al., 2018).

There are several misunderstandings about NSSI, and correlation does not guarantee causation. In other words, mental health symptoms (e.g., depression and anxiety) and NSSI may be related, but does not mean one phenomenon necessarily causes the other. Initially, NSSI was seen as a symptom of borderline personality disorder (BPD); although NSSI can be a symptom of BPD, it also stands alone outside the comorbidities of other psychiatric diagnoses. It was previously believed that childhood sexual abuse can solely influence a person to participate in NSSI. Studies have shown that childhood sexual abuse influences NSSI, but only moderately (Klonsky et al., 2014).

### **Suicidal vs. Non-Suicidal Self-Injury?**

Despite most NSSI participants' motives not being suicidal, that does not mean there are no individuals who self-injure in attempt to commit suicide. It is not uncommon for an NSSI participant to idolize suicide or death (Nock et al., 2006). NSSI and suicide attempts typically co-occur for self-injuring individuals, and NSSI is a risk factor for future suicide attempts (Nock et al., 2006). Researchers have theorized these links; however, future research is needed in this area. One of the many theories researchers have postulated is that individuals who participate in NSSI are less fearful of pain or death, so suicide is not as difficult for them to try (Wilkinson & Goodyer, 2011). NSSI individuals may make conscious decisions to commit suicide, too. It was reported that 70% of adolescents in the study who recently engaged in NSSI reported one suicide attempt in their lifetime (Nock et al., 2006).

### **Mental Illness, Personality, & Non-Suicidal Self-Injury**

Mental illnesses are not rare in people who engage in NSSI. The two most common types of mental illness that NSSI individuals report having are anxiety and depression (Robertson et al., 2013). The most studied personality traits that commonly occur for NSSI individuals are neuroticism, low openness to experience, lower extraversion, conscientiousness, and agreeableness.

Reinforcement Sensitivity Theory (RST) is another personality theory that could apply to NSSI individuals. People with RST have two traits: sensitivity to punishment or sensitivity to reward. RST is also linked to individuals with anxiety or depression (Robertson et al., 2013). A 14-day study (Ose, Tveit, and Mehlum, 2021), found that individuals with personality disorders were more likely to participate in

NSSI. Individuals in the study who have had recent suicide attempts were the most common to partake in NSSI. This is not surprising data since one of the diagnosis criteria of self-injury is experiencing symptoms of BPD. Individuals who live with the effects and symptoms of eating disorders are also susceptible to engage in NSSI; however, Bulimia nervosa is the most common type of eating disorder in terms of NSSI engagement (Ose et al., 2021).

### **Peer or Family Support**

In addition to links between mental health and NSSI there is also the importance of social support. There are also several risk factors that could influence an individual to self-injure, including, but not limited to, childhood maltreatment, physical abuse, sexual abuse, psychological abuse, physical neglect, low self-esteem, and traumatic life events. Having peer or family support can reduce the risk of a person participating in NSSI, especially among women (Christoffersen et al., 2015). Furthermore, social support was noted as especially helpful for individuals with post-traumatic stress disorder (PTSD) and low self-esteem. For example, individuals with trauma from combat or disaster who have social support lessened their distress with PTSD symptoms. Social support is considered a mediator between NSSI and traumatic experiences.

### **Influence from Friends**

According to Syed and colleagues (2020), adolescents may self-injure because their friends also engage in NSSI. NSSI contagion is a phenomenon that can occur when an adolescent is aware of their friend participating in NSSI and then self-injure due to this influence. NSSI can become a trauma bonding experience between peers which can then cause the self-injuring to become more frequent (Syed et al., 2020). Another theory this study presented was that adolescents experience a phenomenon called assortative relating, which is when similar individuals form friendships because of their shared qualities, attitudes, or behaviors. NSSI can become normalized within a friend group, and adolescents who are vulnerable or at-risk may begin to self-injure and participate in NSSI.

### **Abuse, Trauma, & Neglect**

Physical abuse, sexual abuse, psychological maltreatment, physical neglect, and being bullied are just some of the reasons why one may self-injure (Christoffersen et al., 2015). According to Martin et al., (2016), individuals were more likely to participate in NSSI if they have experienced maternal maltreatment rather than paternal. Divorce, inter-parental violence, and low socio-economic status were more contributing factors as to why the individuals self-injured. The odds of engaging in NSSI are increased if a person experiences unfavorable family-life events (Martin et al., 2016).

## **Family Therapy and NSSI**

Much of the treatment for NSSI has focused on prevention or reducing physical harm to oneself (Smithee et al., 2019; Weissman, 2009) and has been individually and symptom focused. In other words, treatments such as cognitive behavioral therapy, dialectical behavior therapy, and psychopharmacological medication management—while important and empirically validated—have focused primarily on treating the symptom and behavior, as opposed to looking at the larger family context where symptoms manifest. Understanding environmental factors which may contribute to NSSI behaviors is important in terms of sustaining long-term remission of NSSI and reducing the risk of repetition (Miner et al., 2016). Even if a college student lives outside of the home in which they were raised, family environment can still greatly impact and contribute to the young person's sense of support around them and the understanding of their experience.

## **Hypotheses**

Based on previous research (Suyemoto & Macdonald, 1995) indicating that female-identifying individuals were more likely to engage in certain types of NSSI (e.g., cutting), it was hypothesized that the sample would be predominantly female identifying. Due to research findings reporting links between NSSI and underlying trauma/abuse in families-of-origin (Miner et al., 2016), it was also hypothesized that individuals who engaged in NSSI would also have a history of trauma and/or abuse, including possible sexual trauma prior to the age of 17 years.

## **Method**

### **Participant Recruitment and Description**

Participants for this study were recruited through the following methods: (1) social media sites (e.g., Women's Advice Group and Mental Health Support) and (2) an email listserv focused on female-identifying students at a Midwestern university. To participate in the study, participants had to report having engaged in NSSI and be at least 18 years old. This resulted in a total sample of 61 participants who completed the survey who ranged in age from 18-42 years with a mean age of 24.26 years ( $SD = 6.01$ ). Most of the sample identified as female (68.9%,  $n = 42$ ), White/Caucasian/of European descent (65.5%,  $n = 40$ ), bisexual (31.2%,  $n = 19$ ), and having at least some college (70.5%,  $n = 42$ ). It is important to note that while we aimed to recruit a female-identifying population, given the research that shows females are at increased risk of participating in NSSI (Suyemoto & Macdonald, 1995), our participants represented diverse gender identities, including gender queer and gender nonbinary.

Additionally, 70.5% ( $n = 43$ ) reported living in the United States with representation from various regions throughout the U.S. (Iowa, Minnesota, Missouri, Wisconsin, Tennessee, and Connecticut) and five individuals reporting from outside the United States (United Kingdom, Malaysia, and Canada). Fifty-four percent of participants reported residing in a suburban or urban area, with 21% reporting living in a rural area. It is important to note that within our demographics, 15-18 participants

did not respond to demographic questions asking about race, sexual orientation, gender, and age. We attribute this missing data to survey fatigue or the desire of the participants to remain anonymous, even though participants were informed that their responses would not be identified. Moreover, participants reported that the family structure in which they were raised consisted of nuclear families (e.g., two parents/caregivers) (49.2%,  $n = 30$ ), step/blended families (8.2%,  $n = 5$ ), single parent families (3.3%,  $n = 2$ ), grandparent families (1.6%,  $n = 1$ ), chosen families (e.g., not biological or legal) (1.6%,  $n = 1$ ), other (4.9%,  $n = 3$ ), and 19 participants did not respond. When asked with whom participants identified as supportive persons in their lives, a majority responded family members, friends, and romantic partners.

## **Measures**

The Non-Suicidal Self-Injury Assessment Tool (NSSI-AT) (Whitlock et al., 2013) was used to assess functions, frequency, age of onset, initial motives, practice patterns, disclosure, and treatment experiences. Participants responded to items using the scale's 7-point Likert measure ("Strongly agree" to "Strongly disagree"). Sample items included "I hurt myself to feel something," "I hurt myself because my friends hurt themselves," "I hurt myself to deal with frustration," and "I hurt myself in hopes that someone would notice that something is wrong or that so others will pay attention." It is important to note that test-retest reliability of NSSI-AT scores in the Whitlock et al. (2013) study was based on a small population ( $n = 25$ ) and thus, more information using larger samples is needed. Participants were also asked to choose all that apply to the following question, "Have you ever done any of the following with the purpose of intentionally hurting yourself?" and were given a list of 15 examples of NSSI actions (e.g., cut wrist, bitten self, punched oneself, etc.).

## **Procedures**

After receiving Institutional Review Board (IRB #20210387) approval from a Midwestern university, data for this study were collected using a variety of recruitment methods. Emails and electronic announcements informed potential participants about the study and included a link to an electronic copy of the survey. Social media announcements were posted on sites that individuals (female identifying) frequented for support around mental health, some of which included NSSI topics. Of the 74 participants who clicked the link and consented to participate, only 61 were eligible to participate and completed nearly most or the entire survey. Upon starting the survey, participants were presented with informed consent followed by a description of the study. If participants agreed to terms and met criteria, they were then provided with primary and secondary NSSI characteristics, NSSI functions, NSSI frequency, trauma scale questions, and a series of demographic questions. Participants were informed that their participation in the study was entirely voluntary and that they could stop the survey at any time. They were also informed that there was no way of identifying their anonymous answers after the survey was submitted. Upon completion of the survey, participants were provided with local and national mental health resources, as well as the opportunity to provide their email address to receive a copy of the survey's results.

## Results

The findings of this study report frequencies and descriptions from the Non-Suicidal Self-Injury Assessment Tool (NSSI-AT; Whitlock et al., 2013) as well as demographics about the sample. Overall, we found that most of the participants who reported a trauma history consequently reported that this history influenced their NSSI behaviors. The traumatic experience that most of the participants shared was a traumatic sexual experience. Out of 46 respondents, 59% of the participants answered "yes" to having a sexual trauma history and 41% answered "no." The least shared traumatic experience of the participants was being a victim of violence, including child abuse, being mugged or assaulted. With this question, 24% reported "yes" and 76% reported "no." The study also offered a section for the participants to self-report a major upheaval in their life that could have shaped their personality or experiences. Within the sample, 69% self-reported traumatic events, while 33% self-reported no other traumatic events. Self-reported traumatic events included cutting off from immediate family members, being cut off due to coming out, parental conflict, emotional neglect, involvement of a parent with drugs/addiction, parental unemployment, and experiences of bullying.

In the last set of questions, the survey asked participants to reflect on how NSSI impacted their life, whether positively or negatively. A majority of the respondents reflected on how NSSI impacted their lives by indicating "the lasting marks / scars are constant reminders of bad / rough times in [their] life" and "in thinking / discussing [their] experience[s] around intentionally hurting myself, [they] have learned a lot about [themselves] and because of it have mentally / emotionally grown." One participant reflected that "[my] scars are my battle wounds – I made it through."

We found that while a majority of participants reported self-harming more than two years ago, others reported a range as recent as one week ago ( $n = 8$ ) to one to two years ago. It is important to note that the researchers of this study provided participants with a list of both local and national resources at the end of the survey to seek out support should they find anything in the survey to be triggering or find that after taking the survey (whether they completed or not) they are considering counseling/therapy support.

Finally, participants were asked what description best describes the family structure in which they were raised. A majority of participants (57%) reported being raised in a nuclear family (e.g., two parents/caregivers;  $n = 30$ ), while just under 30% of participants ( $n = 15$ ) reported being raised in a step/blended (17%) or single parent family (12%). Two participants reported being raised by grandparents, one by chosen family (i.e., not biological or legal), and four others chose "other." Specifically, one participant shared, "I took care of myself and raised my two younger siblings. The extent of my parents involvement was a roof over our heads some of the time." Another participant stated that their living situation was fluid as they went from their mother's boyfriend's place to their grandma's place as well as their dad and stepmom's places.



## **Discussion**

The current study explored the experiences of young adults who have engaged in NSSI, as well as a history of traumatic events and their family support. Overall, we found that most of the participants who reported a trauma history consequently reported an influence on their NSSI behaviors. The traumatic experience that most of the participants shared was having a traumatic sexual experience. Prior research reinforces our findings that certain types of risk factors, such as childhood sexual abuse and interpersonal dysfunction underlie NSSI behaviors (Cheasty et al., 1998; Christoffersen et al., 2014). Researchers postulate that one of the reasons individuals who engage in NSSI can be attributed to a physical, emotional, and sexual abuse history (Zetterqvist, et. al., 2015).

Some individuals in the study compared sex involving physical pain to cutting themselves. Moreover, there are both direct and indirect forms of NSSI, such as cutting and binge eating. According to research, the most common type of NSSI reported for female identifying individuals is cutting (59.2%), while the second most reported behavior is burning and hitting, which is most common for male identifying individuals (Freeman et al., 2017). Previous studies have shown that an individual can participate in up to ten ways of self-harming (Cornell University, n.d.), which is consistent with the findings in the study. NSSI is most likely to occur on the hands, wrists, stomach, or thighs of the individual's body. The severity of the act can vary from superficial injury to lasting scars or disfigurement. In two separate college studies, 33% of participants who reported engaging in NSSI indicated that they should have gone to see a doctor due to the significance of their physical wounds, while only 6.5% in the other study were treated professionally for their self-inflicted injuries (Cornell University, n.d.). The findings in this study reinforce the bulk of research of severity and frequency of NSSI.

Given the finding that approximately one-third of individuals who participated in the study identified as bisexual, it is important for future research to explore additional factors related to discrimination of sexual orientation and links to NSSI. Indeed, minority related stress (Meyer, 1995) impacts individuals living in a heterosexist society who are subjected to chronic stress related to the stigmatization of their identity. This same sentiment can be offered for individuals identifying as gender queer and gender non-binary. Thus, future research might explore the impact of minority-related stress on sexual and gender minority populations in the context of NSSI.

## **Family Therapy as Early Prevention**

As stated earlier in the results section, some of the self-reported events were related to bullying, parental drug addictions, parental conflict, mental health concerns, neglect from caregivers, low social economic status, and emotional trauma. Given that the occurrence of NSSI is likely to continue and that the family is serving a significant role in a young person's life, it is important for couple/marriage and family therapists to consider this mental health phenomenon in context to the family. The inclusion of NSSI in the 2013 Diagnostic Statistical Manual has brought more awareness around the prognosis, symptoms, and duration of NSSI. While research has reported other influences, such as media and peer influences and biological and

psychological vulnerabilities (Schade, 2013), the family can be both a source of strength as well as a source of vulnerability and adaptation of maladaptive behavior patterns. Thus, addressing the function and the family from a systemic perspective can help shift the perspective of clinicians from an individual focus to looking at the relationship NSSI has with the larger family system.

### **Limitations and Future Research**

Since this study was focused on female-identifying populations, the study was limited. However, it is noted that a number of our participants for this study identified as non-binary and/or gender queer. It is also noted that the data were collected from a mostly White sample. Thus, it is possible that data from a more racially and ethnically diverse sample would illustrate divergent or variant findings.

Study participants were also self-selecting, and it also possible that they had strong views about NSSI. Additionally, the findings of the study represent cross-sectional data. In other words, their responses are a snapshot in time and participants were not able to elaborate on their findings in person. Future studies should seek to collect longitudinal data and consider focus groups or in-person interviews to gather more detailed, rich data.

Finally, a next step in this research is analysis of quantitative findings to identify possible correlations between specific types of abuse (e.g., sexual) and type of self-injury; it would be good to conduct qualitative, open-ended interviews with participants to gather rich narratives, which can further our understandings of the complexities of NSSI and inform future treatment/therapy practices.

### **Conclusion**

The results of this study provide important insights into young individuals' experiences who have engaged in NSSI. A majority of participants who engaged in NSSI reported that trauma influenced their NSSI behaviors and that they had experienced at least one traumatic event in their lifetime. These findings suggest that individuals who engage in NSSI do so as a means to cope with trauma from their past, which suggests the need for early intervention (e.g., individual and/or family therapy) to lessen the effects of NSSI. The hope is that this study will serve as a catalyst to encourage mental health clinicians (i.e., family therapists) to screen for NSSI in addition to considering ways that the family might be involved in treatment, especially in young adult populations. Additionally, we hope that this study illuminates the effects of trauma on young adults and adolescents. A next step in this research is analysis of quantitative findings to identify possible correlations between specific types of abuse (e.g., sexual) and types of self-injury, conducting qualitative, open-ended interviews with participants to gather rich narratives, which can further our understanding of the complexities of NSSI and inform future treatment/therapy practices.

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# Creating 3-D Game Characters

**Malcolm Howard<sup>1</sup>**

Senior, B.F.A. Game Design Development Art

**Faculty Advisor: Joshua Seaver**

## Abstract

The creation of 3-D characters for games has always been one of infinite complexities. For a beginner, creating a 3-D game character can feel impossible. Watching a tutorial on the subject may only prove to frustrate the creator even more. As an aspiring 3-D artist for several years, it has often felt impossible to understand how 3-D characters are made. Watching tutorials can help to understand certain processes that are a part of the bigger picture. However, if one doesn't understand how what was watched on YouTube fits into the bigger picture, then they will be just as lost as before. This research paper was created to alleviate this problem for other aspiring artists who want to become 3-D character artists. The goal of this research is to simplify the process so that a beginner can understand the steps to create a character. The workflow defined in this paper will help a beginning artist or hobbyist to understand the process of creating 3-D characters. The workflow will consist of the programs MakeHuman, Marvelous Designer, Autodesk Maya, ZBrush, and Substance Painter. Tutorials on most processes explained here have been linked in the appendix for reference. Definitions of the programs used and industry terms will also be in the appendix for reference.

*Keywords:* character creation, 3-D art, ZBrush, workflow.



*Image 1: Concept Art for the Character Created.*

## Introduction

This paper intends to help the beginning character artist better understand the workflows that allow them to create amazing characters. While specifically focusing on the process of creating humanoid characters, the fundamentals of this workflow can aid in the creation of any character type. Mastering the fundamentals of any craft is key in helping anyone to reach their true aspirations, and that will be no different in this 3-D medium. The processes discussed below may seem complex to the beginning 3-D artist. For that reason, it is recommended that a complete beginner to the world of 3-D art take a step back and learn the basics first. There are lots of useful tutorials and guides out there to start a beginning 3-D artist hopeful off on the right foot. It is strongly recommended that any beginning artist does not jump straight to doing character art. It is the fun part for a lot of artists, however, if the artist does not understand the basics, then the processes that follow will likely be lost on them and leave them frustrated. It would also be useful to familiarize oneself with all of the programs being used in this workflow as they all play important roles in character creation.

There are many challenges that a beginning 3-D Character artist may face. One may be that frustration is setting in because the warning given in the first paragraph was not taken seriously and the artist decided to skip to what they really wanted to do on day one. Other challenges may be financial, learning the craft can be very expensive depending on the learning style of the artist. Some tutorials online may be very helpful to one group of artists, while not at all helpful to another group. Paid tutorials are an option and being educated through secondary schooling is one as well, however, these two options can be very expensive, secondary schooling being much more expensive. Another issue can be getting access to the software that will be needed to create 3-D characters. Most, if not all, of the software costs a of money to get licensing to use. Zbrush individual licenses can cost \$39.95 a month or \$359 annually, it is possible to get this licensing through a university license, however, these are shared and are not freely available at any time. This leads back to YouTube tutorials on the subject because a lot of these tutorials will have you in Industry Standard and expensive software. This doesn't mean that good free software is not out there, it is. One of the biggest in this area is Blender, which does have lots of online tutorials and forums to teach users about creating 3-D art in the program.

The last and possibly the most important challenge an aspiring 3-D character artist may run into is being able to afford hardware capable of doing the job. Unless the artist already has a decent computer lying around, chances are they'll need to go buy one, which will not be cheap. At the time of writing, a good computer for running all of the software discussed will cost at least \$1500. There is rarely a free option in this area for most individuals. Acknowledging all of this, this paper will still attempt to walk an aspiring 3-D character artist through the process to help them understand what this process even looks like, as most beginners likely would not know where to start.



*Image 2: MakeHuman Character Base Model.*

### **Setting up the Base Model**

The first workflow step is to set up the base model of the character. There are lots of ways to get a base model; detailed below we will be using a free application called MakeHuman. The reason for using MakeHuman is to allow for the easy creation of a base model with appropriate proportions. It is recommended that a concept image be used as a guide. Begin by opening up the MakeHuman application. In MakeHuman, adjust the model until it is as close to the concept as possible. Note, do not add any clothes or hair to this model, as that will all be done in later processes. Once the model is satisfactory, navigate to the export options, and in the "Mesh Format" setting, select either Filmbox (fbx) or Wavefront (obj). These will be the file types that MakeHuman is able to export models as, and are two of the most common file types for 3-D models. The easiest way to explain them is that fbx will export with any information that is tied to it, this includes rigs & textures. The obj file type will export with only the 3-D mesh geometry and nothing more.



*Image 3: Marvelous Designer Clothing Being Made.*

The next step in the process is to import the MakeHuman model that was exported from MakeHuman into the program Marvelous Designer. Marvelous Designer is being used here because it will allow for clothing to be created and fitted right onto the model, and have believable folds. This step is not nearly as simple as the last, and how long it will take is entirely based on the creator's skill level. Depending on the complexity of the outfit being created, it could take somewhere between 8 to 16 hours to complete. Create the clothes of the character to resemble concept or reference images as closely as possible. Once the character's outfit is fully created and fitted it is time to prep the outfit for exporting from Marvelous Designer. One by one, select each of the patterns found in the 2D Pattern Window, right-click on the pattern on the model in the 3-D window, and choose the "remeshing" option. Right-click that same pattern again and choose the "Quadrangulate" option. These steps will ensure that each garment piece is made up of polygons and not triangles. Generally, when working with 3-D models it is better to have polygons over triangles, since polygons are overall easier to work with.

Now to export the pieces for use in the next step of the process, select each piece of a garment, and choose export "OBJ (Selected)." Choose a single object and the thin option, then hit "OK." The scale option may need to be played with a bit to make sure it fits the model properly in other applications, such as Maya or Zbrush. Do this for each garment piece. The final step involves bringing the exported garment meshes into Maya. Select each garment and its pieces and choose to merge by distance. This should weld the pieces of a garment into one single piece instead of multiple pieces that make up the garment. This step could be done in Zbrush, however, it was easiest to visualize the change after the merge in Maya. Export each now-hole garment piece from Maya, and the character and their clothes are ready to be detailed. A couple of tutorials for Marvelous Designer will be linked below.





*Image 4: Zbrush Character with Final Details.*

### **Sculpting/Modeling the Character**

This step can be done in Maya, Zbrush, or Blender. For this project, it was done in Zbrush. After exporting the clothing from Maya, import them and the base model from MakHuman into Zbrush, ensuring that the clothes fit the model properly before continuing. Making sure the clothes fit properly can be finicky and may take a lot of trial and error before getting things right. Simply scaling the clothes to fit can work, however, it is recommended to have the clothes come into Zbrush at the correct scale from the start, which may require changing the export measurement of the garments from Marvelous. Once the clothes fit properly, with each individual piece of clothing, use the ZModler tool in ZBrush to extrude all faces inside the mesh, as much as personally preferred; this will flip the normals of all the faces, turning them invisible. Now go and flip the normal of the garment. The piece now has thickness and is ready for sculpted detail.

At this point, sculpt the character and clothing to match the concept or reference image being used. In this project, the model of the character without the clothes was detailed first. Once they were taken care of, the garment itself was sculpted on and given the detail and adjustments needed to bring it closer to the concept image. This process will likely define what the final product looks like, so taking the time necessary to ensure everything looks great before considering this step finished is vital. When all detailing is finished, the next decision needs to be made: how will this character be textured? In this project, the textures were separated into textures for clothes and clothes for the body.

Merge all of your garments subtools into one subtool and export them from Zbrush as an fbx. Now do the same for the body. Note, it is standard for hair and eyes to be separate as well. Export everything else accordingly, making sure to name each thing "High Poly" or something along those lines to ensure that there

is no confusion later on. These "High Poly" models will be used to bake detail onto the "Low Poly" models that will be created in the next step. Now go back to before everything was combined and decimate each piece to the point where the polycount goes down, but the general shape of the mesh is maintained. This leads to the next section about retopologizing the character. Once everything is decimated properly, export each piece. Naming these files something like "Decimated" should help identify these as decimated meshes. This is where good file organization will be helpful in lessening possible confusion amongst all the files that have likely been acquired throughout this process thus far. When everything is exported, it is time for the next step. Tutorials on getting started sculpting in ZBrush are linked below.

## **Retopologizing the Character**

Retopology is a very important step. It is likely that the high poly meshes that were exported in the last step had too many and too messy polygons (100k+ polys) to be efficiently animated, let alone useable in a game environment. This is the reason that decimating the model and pieces in the last step was vital. As an added benefit, it will be easier on the program being used for the retopology process. Import the decimated meshes into Maya to begin the retopology process. Select any of the meshes imported into the scene and activate live mode. This will allow polygons made with the Quad Draw tool in Maya to be able to snap to its surface, which will allow the finished mesh to match the shape of the original or "live" object. The next step would be to open the Quad Draw tool and start retopologizing. One of the best practices in retopology is to first look for parts of the mesh to place loops, then fill in the hole from there. Do this for each mesh that was imported into the scene. Once each mesh has been retopologized, it is time to UV the character. A couple of tutorials showing the retopology process are linked below.

## **Setting up the UVs for the Character**

The process of setting up the UVs for the character can be complex but necessary for modern workflows that use Physically Based Rendering (PBR) programs like Substance Painter. The way that an artist will want to UV their character will depend on the purpose that this character will serve and the limitations of it within its final destination. For example, characters being made for a mobile game may have all of their UVs laid out into one square to lessen the amount of materials that need to be loaded within the game. For the purposes of this exercise, the character created here will be UV-ed by selecting each piece of clothing and carefully cutting, unwrapping, and laying out these UVs to the point that they are evenly spaced and make sense. Depending on how many materials the character is allowed to have (the mobile game character in the example), each separate piece of the character should be grouped with other pieces or by themselves. The difference between these two options is that one option will ensure that each clothing piece has the highest texture quality possible, and the other will allow for the use of fewer materials and the lower cost of a lesser-quality texture. There are points in a development cycle in which both of these strategies will be useful. For creating a character for the practice of character creation, it is recommended that you make all textures as high quality

as possible, which will ensure that every part of your character looks fully realized and stunning. Meaning each separate part of a character will have their own UV layout and materials applied to them individually. When the UVs are finished, it is recommended to export the models as done at the end of the "Sculpting/Modeling the Character" section. Make sure to apply 4 separate materials with non-overlapping UVs: one for all the clothing, the body, the eyes, and the hair. Now it is time to export the character. Select all pieces of the character in Maya, then choose to export them using the naming convention "Low Poly." A couple of good UV layout tutorials will be linked below to allow for deeper explanation and visualization of this process.



*Image 5: Textured Character in Substance Painter.*

## **Texturing the Character**

Once the artist has decided and committed to a UV layout strategy, it is time for possibly one of the most complex steps in this entire workflow. The last two steps in the character creation workflow, retopology and UV's, have been complex but completely technical at the core. However, texturing is left completely to the interpretation of the artist. While there are technical aspects, getting the character to the final stage visually will depend on the direction of the concept and how pleasing it looks. There will be challenges trying to match things up perfectly to how they may have first been envisioned or how things are portrayed in the concept art.

The character created in this project was textured within Substance Painter. Once the "Low Poly" character model is imported into Substance Painter this is where the naming conventions from earlier will come into play. The "High Poly" character models that were exported from ZBrush earlier will need to be baked onto the "Low Poly" character in Substance. Choose to Bake Mesh Maps in the "Texture Set Settings" window and in the "High Definition Meshes" box, open the file of the corresponding

high poly model for this material. This will give the character all the detail that was sculpted on it in Zbrush. After the baking is complete, it is time to texture the character accordingly. A couple of tutorials for texturing characters will be linked below to show possible ways to texture them.

### Conclusion

This wraps up the character creation process. A base mesh was created, and from that, a finished character is born, ready to be rigged, animated, and eventually flung into a game. This character has been dressed, sculpted, polished, retopologized, UV-ed, and finally textured. Rigging, which has not been mentioned in the slightest, would likely be the next logical step after the texturing process. Following the rigging process, the character would be able to be animated. This is one of the many workflows through which remarkable 3-D characters are created. Easier and more difficult workflows exist, and there will always be new things to learn with each character an artist creates. However, what was presented here should help the reader understand what a decent character creation workflow looks like and allow them to grow as a 3-D character artist.

### Appendix

#### Autodesk Maya or Maya

- Autodesk Maya is a 3-D computer graphics application that is used to create assets for interactive 3-D apps, animated films, TV series, and video games.

#### Base Model

- A base model is a model, typically humanoid, that is used as a starting point in the process of 3-D modeling in order to save the time of rebuilding the same thing repeatedly.

#### Blender

- Blender is a free and open-source 3-D computer graphics software toolset used for creating animated films, visual effects, art, 3-D printed models, motion graphics, and computer games.

#### Decimate or Decimation

- To decimate a model is to reduce the model's Polycount in an effort to make the model more easily processed in other applications.

#### MakeHuman

- MakeHuman is a free and open-source 3-D computer graphics middleware designed for prototyping photorealistic humanoids.

#### Marvelous Designer or Marvelous or MD

- Marvelous Designer is a powerful 3-D computer graphics software used to create 3-D clothes for us in film, television, game development and interior design.

#### Marvelous Designer Tutorials

- Marvelous Designer Beginner Course – Part 1 – The Basics By: veryveig
  - [https://www.youtube.com/watch?v=eGi\\_NGSW3Zs&ab\\_channel=veryveig](https://www.youtube.com/watch?v=eGi_NGSW3Zs&ab_channel=veryveig)

- Marvelous Designer Beginner Course - Part 2 - Creating an Outfit By: veryveig
  - [https://www.youtube.com/watch?v=I00JpX3A4dc&ab\\_channel=veryveig](https://www.youtube.com/watch?v=I00JpX3A4dc&ab_channel=veryveig)

### Poly or Polycount

- In the world of 3-D art, Polys are used to define the density of a digital model made of polygons. The Higher the polycount or "High Poly" a model has, the more polygons the model is made of. The Lower the polycount or "Low Poly" a model is, the fewer polygons the model is made of.

### Retopology or Retopologize

- The process of converting high polycount models into models with lower polycounts.

### Retopology Tutorials

- Maya Retopology: Ultimate Beginner's Guide By: JLMussi
  - [https://www.youtube.com/watch?v=PFmbSPSc0dk&t=543s&ab\\_channel=JLMussi](https://www.youtube.com/watch?v=PFmbSPSc0dk&t=543s&ab_channel=JLMussi)
- Retopology for Beginners in Maya by: FlippedNormals
  - [https://www.youtube.com/watch?v=xpDWta5O3n8&t=57s&ab\\_channel=FlippedNormals](https://www.youtube.com/watch?v=xpDWta5O3n8&t=57s&ab_channel=FlippedNormals)

### Rig or Rigging

- The process of Rigging in the digital 3-D space is the placing of digital bones within a 3-D model to enable the model to move or animate.

### Substance Painter

- Substance painter is a 3-D computer graphics program that is used to texture 3-D objects in real time.

### Texturing Tutorials

- Substance Painter for Beginners Tutorial By: JLMussi
  - [https://www.youtube.com/watch?v=s2MOx1Iteik&t=3480s&ab\\_channel=JLMussi](https://www.youtube.com/watch?v=s2MOx1Iteik&t=3480s&ab_channel=JLMussi)
- Texturing your First Game Asset in Substance Painter [BEGINNER TUTORIAL] By: Stylized Station
  - [https://www.youtube.com/watch?v=hLfKU4yrlFM&ab\\_channel=StylizedStation](https://www.youtube.com/watch?v=hLfKU4yrlFM&ab_channel=StylizedStation)
- Substance Painter Tutorial for Beginners - Intro to Basic Texturing By: Stylized Station
  - [https://www.youtube.com/watch?v=JJlr0ltRpm4&ab\\_channel=StylizedStation](https://www.youtube.com/watch?v=JJlr0ltRpm4&ab_channel=StylizedStation)

### UV Map or UVs or UV

- UV mapping is the process of projecting a 2D image onto a 3-D model's surface for texture.

### UV Mapping Tutorials

- UV Map Anything in 5 Minutes with Maya by: On Mars 3-D
  - [https://www.youtube.com/watch?v=t5Co6SuzoQw&t=214s&ab\\_channel=OnMars3-D](https://www.youtube.com/watch?v=t5Co6SuzoQw&t=214s&ab_channel=OnMars3-D)
- Maya tips & tricks - Straighten UVs by 3-D Hacks
  - [https://www.youtube.com/watch?v=zDeBeYxn8Jg&ab\\_channel=3-DHacks](https://www.youtube.com/watch?v=zDeBeYxn8Jg&ab_channel=3-DHacks)
- Maya Beginner Modeling Tutorial – UV Unwrap By: Alex Cheparev
  - [https://www.youtube.com/watch?v=VHUIJ-kte1n8&t=1025s&ab\\_channel=AlexCheparev](https://www.youtube.com/watch?v=VHUIJ-kte1n8&t=1025s&ab_channel=AlexCheparev)

### Zbrush

- Zbrush is a digital sculpting tool that combines 3-D/2.5D modeling, texturing, and painting.

### Zbrush Sculpting Tutorials

- Zbrush tutorial for absolute beginners by Wekster's Geeky Stuff
  - [https://www.youtube.com/watch?v=8qJGX\\_o6-qU&ab\\_channel=Wekster%27sGeekyStuff](https://www.youtube.com/watch?v=8qJGX_o6-qU&ab_channel=Wekster%27sGeekyStuff)
- Getting Started with Sculpting - ZBrush for Beginners Tutorial By: FlippedNormals
  - [https://www.youtube.com/watch?v=\\_yKGfcp2z3k&t=54s&ab\\_channel=FlippedNormals](https://www.youtube.com/watch?v=_yKGfcp2z3k&t=54s&ab_channel=FlippedNormals)

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# **Defining Esports Student-Athletes and the Behaviors that Affect Academic Performance**

**Chueseng Lo<sup>1</sup>**

Senior, Human Development and Family Studies

**Faculty Advisor: Dr. Kevin Doll**

## **Abstract**

Esports has been an emerging topic within the past decade. As video games are being more competitive, so is the potential of Esports for college teams to be made. Students are provided opportunities of recruitment to play at the collegiate level for various prizes, such as money for their Esports programs or scholarships. There are studies that investigate the personal and academic well-being of student-athletes within physical sports but there are nearly none for student-athletes within Esports. The question arises if the term student-athletes can be used in Esports, as there are debates for and against that label. Esports student-athletes have behaviors like student-athletes in traditional sports (i.e., high achievements in academics, personal wellbeing, etc.) and have the same responsibilities in terms of academics. If the behaviors of student-athletes and Esports student-athletes are similar as reported in the literature, then Esports student-athletes should have a higher academic achievement than the regular student population. This study sought to find the comparison between Esports student-athletes and student-gamers within the general student population by comparing academic achievement behaviors. This study was conducted at the University of Wisconsin-Stout. Electronic surveys were sent to the Esports student-athletes and student gamers (students that plays video games within the general student population) inquiring about the number of hours they spend on video games and academics. The study found that Esports student-athletes have a difference of 16.8 average studying hours compared to student gamers. Student gamers have 0.24 higher average hours of playing video games. but the grade point average (GPA) of both groups is 3.23. Esports student-athletes and student gamers do not have the same academic achievement behaviors, but they both are able to have the same academic performance.

*Keywords:* Esports, student athletes, academic achievement behavior, video games.

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<sup>1</sup> Chueseng is a McNair Scholar; he also presented this research at the National Conference on Undergraduate Research (NCUR--Ed.).

### Introduction

In the past decade, Esports competitions have been bringing video games to a professional competitive scene (Hamari, 2017; Gerber, 2017). Esports can be described as video games that are played competitively at a high skill level. Examples of video games that have high skill levels are multiplayer online battle arena games (MOBA), like League of Legends, and first-person shooter games (FPS), like Counter-Strike: Global Strike. In MOBA games, players must have quick decision-making skills to turn the tides of the game into their favor, whereas in FPS games a player must have fast reaction times to shoot their opponents as soon as they see them. There are live broadcasts through streaming websites, such as Twitch and YouTube, that display the sheer competitiveness of video games and entertainment to its viewers (Hamari, 2017; Gerber, 2017). In comparison to traditional sports, the time and effort are similar in terms of how student-athletes are expected to train at a high level (Miles, 2015). In both areas of Esports and traditional sports, athletes are required to put an immense amount of time into practice where athletes hone their skills to be sure they are in top shape. Just as in traditional sports, there are teams within Esports that are aimed to serve for team-based video games. Being in a team requires the athletes to be able to trust one another, cooperate with each other, and enhance their video game skills. Due to Esports having team reliant video games, Esports has been given opportunities to recruit for competitive spaces.

The popularity of Esports made itself accessible to colleges where students have the opportunity to play video games and obtain financial support for their professional development. By doing this, students who are participating in Esports programs and competing are considered as student-athletes. As such, Esports could allow student-athletes to advocate for themselves as well-balanced, determined individuals for future professional development. This argument brings the term student-athletes into a broader area of study, as student-athletes are typically known for playing traditional and physical sports (Miles, 2015). This argument also brings into question how student-athletes within Esports programs are similar or different to student-athletes that participate in physical sports regarding their academic performance. One aspect of how the two groups are similar is through the amount of time and effort an athlete puts not only into their practice but into their academic activities. Although Esports student-athletes put similar amounts of time and effort into their academics, they might find it difficult to perform well in their academics since competitive video games can take heavy toll on a student's well-being. The balance between the world of video games and academics can be hard to maintain as video games could bring entertainment and pleasure whereas academics bring responsibility. This study will address the following research questions:

1. Do Esports student-athletes have greater difficulties in academics due to playing video games competitively?
2. Do Esports student-athletes behave like traditional student-athletes and excel in academics?
3. Does playing video games leisurely negatively affect academic achievement instead of playing video games for a sports?

Upon looking into Esports in-depth, there is not much research being conducted upon such players and athletes. Therefore, this study will be conducting

similar research of comparison of student-athletes and non-student athletes. We hope to determine the difference between student gamers, students who play video games causally, and student-athletes within an Esports program. A student gamer can be defined as a student who plays video games on their own time of leisure and is not competing under an organization. An Esports student-athlete is a student who plays video games competitively for the university. The goal of this study will primarily be looking at academic achievement behaviors given that a student-athlete's ability to compete and be funded is based off academic achievement (Miles, 2015).

This study will take place at the University of Wisconsin-Stout because they have implemented a new Esports program in the year 2020. As there are new student-athletes within the University of Wisconsin-Stout's Esports program, this study will have new information to bring to the realm of Esports. The role of being a student-athlete in Esports may bring difficulties to the student's academic achievement as Esports also brings stressors, such as practice and competitions like traditional sports. Therefore, investing the impact of Esports on student-athletes is an important area of study.

### **Purpose of Study**

The purpose of this study is to further examine the field of Esports regarding Esports student-athletes' behaviors within academics. A student-athlete is an individual who is participating in an organized sport within an educational institution. Esports are events where video games are played competitively. This trend has been rising since the year of 2010. Esports are now being recognized as a program that institutions are accepting into their athletic programs. Although there are arguments that Esports is not an actual sport (DiFrancisco-Donoghue, 2019), the nature of the competition is nearly the same. Currently, there is little research regarding the field of Esports, and to narrow it even further there is very little research among Esports athletes itself. A majority of studies are based upon student-athletes that are in traditional sports compared to non-student athletes. In comparison to these types of studies, my research compares student-athletes in Esports and students who are gamers regarding academic performance. As a long-time gamer myself and joining an Esports program at an institution, it is important to provide more research within this area of topic.

### **Literature Review**

#### **Relevance of Esports in College**

Despite the continuing rise of Esports, there is scant literature on this topic. The materials of Esports often fall into the field of "sports management" (Hamari, 2017) but with more technologies often using online streaming platforms, such as YouTube and Twitch (Hamari, 2017; Gerber, 2017; McCarthy, 2020), it has become more accessible for viewers to watch. The internet is a resource that allows Esports to become more publicized and to be used within institutions (Hamari, 2017; Gerber, 2017; "Next College", 2018). This allows institutions to target upcoming students interested in competing within Esports to become a student there and receive

scholarships ("Next College", 2018; Schaeperkoetter, 2017). Even with the amount of accessibility that Esports is offering, there is still not enough information about student-athletes within Esports programs other than knowing which college is the best in the competition of Esports, such as Maryville University for the game, League of Legends. As Esports is being more recognized within college campuses, the name of Esports is still expanding as colleges are now seeing the advantages of having an Esports program that can benefit them economically (McCarthy, 2020). Although students may get scholarships to play in an Esports program, we do not know how much work a student does to upkeep with their academics or how much time they put into their games. Competing at a high level in video games against other teams around the nation must require a high amount of time put in to stay in top shape just like student-athletes within traditional sports.

### **Factors Affecting Academic Performance**

The prevalence of video games grew to be seen as a negative impact on an individual's academic performance, but there is little research that supports this claim. There are other factors that can affect academic behavior and Jackson et al. (2011) showed that the factor of video games can negatively influence one's academic performance based on the number of hours being put into video games. Jackson et al. (2011) is able to show that skills, such as visual spatial skills, were gained from internet use and video games that can benefit academic performance, but the study was not able to provide insight if being a student-athlete. The study by Adžić et al. (2021) is one of the few that explained how the amount of time spent on video games can affect academic achievement and the more time invested into games will decrease the academic achievement. The conflict arises if an Esports student-athlete is expected to devote dedicated time into Esports, it is important to identify gaming can negatively affect a student's academic performance. However, studies show that finding a balance of studying and playing video games shows no difference of academic achievements between student-athletes and non-student athletes (Adžić, et al., 2021).

### **Self-Motivation**

Self-motivation is a factor that influences student-athletes to have better academics (Miles, 2015). Miles (2015) states how "motivation to be academically successful is not just self-driven" (13); motivation can be caused by different influences like people around a student-athlete, such as coaches and professors. This expresses the importance of academics first before their competition. Another significant influence that affects self-motivation are the many scholarships provided for academics through Esports engagement (Schaeperkoetter, 2017; "Next College", 2018; McCarthy, 2020). Scholarships given out to the student-athletes often need the student-athlete to do well within their academics, which can be self-motivation to keep their academics up. Self-motivation can also factor in the rewards aspect of video games (Adžić, et al., 2021). After a long day of work or even schooling, the rewards of playing a video game can be a factor that causes self-motivation to do well in school to receive the reward for putting more time into video games.

## **Mental Health of Esports Student Athletes**

Although student-athletes are expected to be in top shape for competition, it takes a physical and mental toll to meet this expectation. Therefore, there is a need to assess various methods that can help each individual to maintain their academic performance. The difference between Esports and traditional sports is that Esports consists of video game competitions; thus, many people do not see Esports as an actual "sport" (DiFrancisco-Donoghue, 2019). But student-athletes within Esports programs are just like other student-athletes: they maintain practices before a competition and have similar traditions, such as team meetings (DiFrancisco-Donoghue, 2019). DiFrancisco-Donoghue (2019) explains the amount of preparation it takes for an Esports student-athlete to maintain their well-being. Esports student-athletes must take care of themselves physically and mentally. An Esports student-athlete would maintain their physical health by eating nutritionally and having a good sleep schedule. Esports student-athletes take care of their mental health by taking time off from video games to ensure they are not exhausting themselves mentally. Student-athletes not taking care of themselves could lead to many stressful issues. The coping methods to deal with stress are similar across most student-athletes and non-student athletes (Jennings et al., 2018). Jennings et al. (2018) found how most coping mechanisms for stress are related to what each student is familiar with doing but it does not show which coping methods work more efficient. Student-athletes within Esports cope with stress by gaming or other coping strategies such as listening to music (Jennings et al., 2018). Student-athletes are not alone in battling these issues. There are faculty members that work with student-athletes to help provide resources to help them stay on track academically. Overall, without the staff support to help students to stay focused (DiFrancisco-Donoghue, 2019) or without coping mechanisms (Jennings et al., 2018), a student-athlete's academic performance can decrease.

## **What is the Gap?**

This study aims to fulfill the argument that Esports student-athletes should be justified in claiming the title as student-athletes. The gap within this research is that not many studies focus on student-athletes based in Esports programs. Instead, these studies focus on student-athletes within traditional sports (Jennings et al., 2018; Miles, 2015), therefore the current study fills the gap in the research on behaviors of Esports student-athletes (DiFrancisco-Donoghue, 2019). This study will not just be looking at how video games affect academic performance (Adžić et al., 2021), but also looking at how video games impact academic behavior.

The study aims to examine the behavior of Esports student-athletes to see if they are like student-athletes in traditional sports regarding the upkeep of their academic performance. The primary focus is to see if Esports student-athletes have better academic behaviors than student-gamers. This would be equivalent to student-athletes and non-student athletes (Miles, 2015); the study also seeks to learn if video games do impact academic performance (Adžić et al., 2021). In addition, the researchers wish to examine the number of hours dedicated to video games, the impact of a student's academic grade and to find a balance between the two.

This study will help with the Esports area of research interest as there is still scant literature in this area.

## **Method**

### **Participants**

Participants in this study are students who reside at the University of Wisconsin-Stout. The two selective groups of student-gamers are students who are not in an Esports program but play videogames and student-athletes who are officially in the UW-Stout Esports program. There was a total of 13 participants that participated in this study. Among the 13 participants, there was 6 Esports student-athletes and 7 student gamers. There was no demographic breakdown of the participants backgrounds as we wanted to keep all participants anonymous. We wanted this study to be fair and equal to all who participated. The researchers felt that the information of demographics was not needed as they were mainly concerned with the quantitative findings of this study to explore links to academic behavior.

### **Procedure**

All participants were given a survey which consisted of five questions. These five questions asked if they were an Esports student-athlete or student gamer, number of credits they were taking, number of hours dedicated to video games within a week, number of hours dedicated to studying within a week, and grade point average. Participants were informed that their participation in these surveys was voluntary. The survey was given out through a link provided by the researcher through a social media app, Discord, that is most prevalent to gamers. Discord was chosen because it is the most common application that gamers use to interact with each other. Through Discord, the link was sent to specific servers that contained both groups: student-athletes who are competing in Esports and student-gamers in the college campus of Stout. The participants were not provided with a paid incentive, and participation was voluntary. This study was approved by UW-Stout's Institutional Review Board.

### **Measure**

In the survey there were four questions which evaluated the characteristics of participants' academic performance, including how many credits the participant was taking in the past semester, their grade point average, time spent on video games they played within a week, and how many hours of studying they did within a week.

#### ***Time Spent on Video Games***

Students were asked how many hours they dedicated to video games within a span of a week. This question clumps both leisure and practice. The reason for clustering them is to answer the question if video games affect a student's academic achievement.

**Time Spent on Studying**

Students were asked how many hours of studying they spent during the week. This numerical answer could find whether Esports student-athletes put in as much work into their studies as playing video games for practice or even leisurely. For students who play video games leisurely, this numerical answer could find if they put in less or more work than Esports student-athletes.

**Grade Point Average**

Students were asked to answer what was their grade point average (GPA) from the past semester (on a scale of 0.0 – 4.0). Identifying their GPA could help explore the effect of hours spent playing video games and studying.

**Number of Credits**

Students were asked about the number of credits (a numerical number of instructions within courses) they were taking last semester, ranging between 12-18. The reason for asking students to answer how many credits they were taking was to determine how much studying a student should have been doing within a week. The equation to this is ( $2 \times \text{number of credits} = \text{number of hours expected to study}$ ).

All answers to the questions asked had an average. Investigating the hours dedicated to studying could find if there is a correlation indicating video games affecting their academic performance.

**Results****Data Analysis**

To determine academic achievement, this study focused upon the student's GPA with factoring the number of hours that is put into video games in parallel to studying. Although having more survey responses would increase accuracy for the selected populations, the 13 survey responses that were recorded showed similar results between the two groups. Most factors included number of hours of playing video games, GPA, and the number of credits a student is taking. These factors were all similar; however, the number of hours for studying was different.

Entries	1	2	3	4	5	6	7	8	9	10	11	12	13
Esports athlete?	Y	Y	Y	Y	Y	Y	N	N	N	N	N	N	N
# of hours into video games	25	30	25	28	30	20	50	22	32	50	15	5	12
# of hours into studying	15	25	15	28	25	40	12	7	1	8	15	2	10
# of credits	13	15	15	15	14	15	12	14	15	16	18	12	16
Avg GPA	3	3	3.2	3.4	3.2	3.6	3.2	2.5	3.1	3	3.5	3.4	3.9

Table 1: The results that were recorded from the survey that was taken by the students that chose to participate in this study. There are thirteen participants that were in the study. There are two distinctive groups that are recognized as either being an Esports student-athlete or not. This table shows the number of hours that was recorded for playing video games and the number of hours recorded for studying within a week. The table shows the number of credits each participant carried which indicates their class load within the semester along with their grade point average.

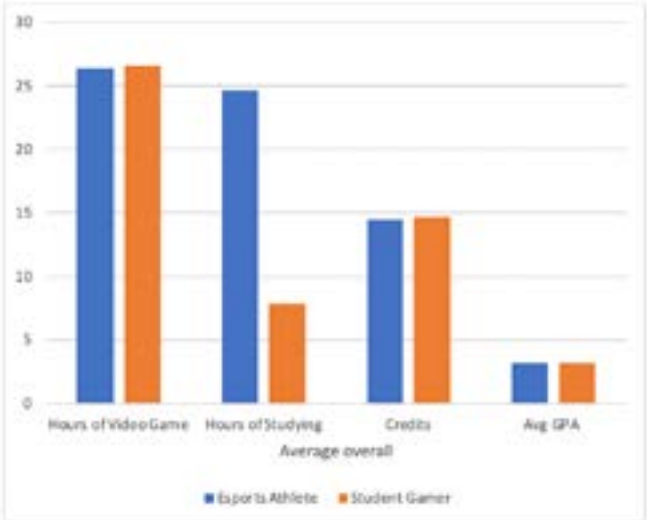


Figure 1: Average Results Recorded from Esports Student-Athletes vs Student Gamers. The bar graph shows the comparison of the two groups within this study. The categories that had similar results were the number of hours playing video games, the number of credits a student was taking, and the average grade point average within the semester. The contrast between Esports student-athletes and student gamers was in the number of hours for studying. There is a difference between how many hours an Esports student-athlete puts into compared to students who play video games casually.



Average Calculation Results	Esports Student-Athlete	Student Gamer
Hours of Video Games	26.33	26.57
Hours of Studying	24.67	7.87
Credits	14.50	14.71
Average GPA	3.23	3.23

Table 2: Calculated Average Results from the Study. The table took two separate calculations between the two groups, Esports student-athletes and student gamers. The table calculated the average amount of hours playing video games and studying of all the Esports student-athletes to represent how much an Esports student-athlete may spend playing video games and studying within a week. The same calculation was made of finding the average number of hours a student gamer plays video games and studies within a week. The table also represents the average amount of credits each group has taken within the past semester to understand their workload. Lastly, the average grade point average (GPA) of both groups was calculated to compare academic performance.

**Hours Playing Video Games**

This study found the amount of time spent on video games to be similar in both groups of the study. Although the average number of hours student-gamers put into video games had a 0.2 higher difference, the comparison of the two groups can be considered equal to say that both groups play video games for the same number of hours within a week.

**Hours Spent on Studying**

This study found the amount of time spent on studying was higher in the group of Esports student-athletes. There is a difference of 16.8 average hours of studying between the two groups. This factor is to be expected, informed from studies like Miles (2015) where traditional student-athletes put more time into academic-related work. Student-athletes could be working harder in academics to ensure that they keep their status as a student-athlete (Miles, 2015). The results from this study showed that Esports student-athletes have a higher academic achievement behaviors as student gamers spends less time towards their academics.

**GPA and Credits**

This study found that Esports student-athletes and students who play video games for leisure have similar GPA of 3.23. Through the numerical findings and inferencing upon them, we can speculate that Esports student-athletes have a higher academic achievement behavior than students who play video games leisurely through the differences on the number of hours studying. This speculation comes from the time dedicated to studying as the Esports student-athletes as they have more time spent studying compared to student gamers.

### Discussion

Defining the term "student-athlete" is broader than ever as Esports brings competitive athletes all over the nation in hopes to make a possible career path through video games. Today more than ever, colleges are investing in Esports programs. Because of the amount of time an Esports athlete devotes to video games, it is important to identify whether gaming can negatively affect a student's academic performance. This study questioned whether Esports student-athletes have more difficulties in academics due to treating video games as a sport. The results of the research suggest that the amount of time student-athletes puts into video games does not negatively the academics of Esports participants.

Although Esports student-athletes are expected to have a higher amount of time spent playing video games due to practice and competitions, they have a similar number of hours as students who plays video games for leisure. Using the average amount of hours dedicated to video games, student-gamers only had 1% higher amount of time dedicated to video games, but since there was only a 1% difference, there is not enough data to say with certainty that student-athletes put in less time dedicated to video games. Therefore, for the little difference, we conclude that Esports student-athletes and student-gamers have similar number of hours with only 0.24 difference in average. There were participants, such as #7 and #10, who had an extreme number of hours dedicated to video games, but these can be seen as outliers, from a statistical standpoint. Because of the extreme amount of time dedicated to video games, we decided to use the average amount of the whole instead.

The focus of this study was to explore if Esports student-athletes do better than leisure gaming students in academic performance. The numerical stats that were obtained from this study showed that student-athletes in Esports excel in academic achievement behavior. Therefore, this study infers that Esports student-athletes do put in more time to academics as they have a higher amount of time put into studying. With the number of credits that the student-athletes were taking, it is reasonable that they are putting in the same or a little more work into their studies to make sure that they can have a balance to their lives and stay in their Esports program for competitions. The behavior of putting more time into studying has answered the question if Esports student-athletes have similar behaviors as student-athletes that plays in sports (Miles, 2015). If there were more participants, the study could have more data to dictate the behaviors of Esports student-athletes to see if their hours put into studying were like the few that were recorded within similar studies regarding traditional student-athletes.

This study found that student gamers do not excel or underperform compared to Esports student-athletes in academic performance. The researchers expected that student-gamers were to underperform in academics because they are playing for leisure unlike Esports student-athletes playing video games as a sport. The result of this study answers our initial question: will playing video games for leisure negatively affect academic performance due to the different intentions of video games? The study shows that it does not affect academic performance. Although the student-gamers did not have the same academic behaviors as Esports student-athletes, their result in academic performance were the same. There could be other factors that were not accounted for in this study that affect the student-gamers' academic

performance such as mental health, stress, or motivation.

This study debunks the common stereotype that video games negatively affect academic performance. This negative stigma of video games is not supported since the study that we conducted showed that there is not any cause and effect relationships. This study did not look at all factors that could affect academic performance, but within this study we found that the number of hours dedicated towards video games does not affect academic performance as both student-athletes and student gamers have a similar average GPA. The results in this study should be interpreted with caution based upon their GPA because there are other factors that could influence a student's academic achievement, such as stressors of mental health, course difficulty, and life itself.

### **Conclusion**

The present study found that Esports student-athletes do well managing their academics despite heavy video game consumption. Compared to other studies, student-athletes have better academic performance behaviors and video games do not affect academic achievement if the intention is not for leisure. For Esports student-athletes, playing video games for competition can be treated as like a real sport, since they serve for practice and allow the student-athlete to be best they can be. Although playing video games competitively can still be for leisure, the intention of this study was to determine whether the behaviors of student-athletes in sports are seen in Esports student-athletes as well.

Although the results from this study do not follow our expectations that student-athletes do better than the average student using video games, there are additional factors, such as clubs, outside activities, mental health, that can affect an individual's performance in school that were not looked at. Future research could be done to look more directly at an Esports player's life to get qualitative data on such students-athlete's academic achievement. If the study was to be conducted further, the study would have to look at the demographics of the students to determine which group of people are more targeted towards dedication for video games and how it affects their academic behaviors. To determine academic behaviors in further research, the study would look at specific academic behaviors, such as how a student studies.

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# **Understanding the Effects of High Temperature Stress and Weathering on Concrete Strength**

**William Pomeranke**

Senior, Applied Science, Materials and Nanoscience

**Faculty Advisor: Dr. Matthew Ray**

## **Abstract**

Concrete exists everywhere in our modern world, so there is a need for a deeper understanding of the stresses it undergoes and how these stresses affect its compressive strength. To do this, we have examined three variables that affect strength: (i) exposure to excessive heat, (ii) the ratios of sand, cement, and gravel in the final concrete, and (iii) chemical testing. It was predicted that as the heat that the concrete was exposed to increased its compressive strength would decrease. A correlation was found between increased heat and decreased compressive strength, ratios were developed that were stronger than the base concrete, and finally preliminary results from chemical testing were gathered. The main result from chemical tests was that further and more vigorous testing was required as the results that were generated were not very substantial.

*Keywords:* concrete, compressive strength, cement, heat stress, weathering

## **Introduction**

Concrete is composed of four materials: cement, rock, sand, and most importantly water. When the cement reacts with the water, it undergoes hydration. During hydration, the major compounds in the cement form chemical bonds with water molecules and form hydrates. The main two hydrates formed during this process are tricalcium silicate and dicalcium silicate; their formation can be seen in equations one and two. These two hydrates contribute to the strength, with the tricalcium silicate contributing to early 7-day strength and the dicalcium silicate contributing to longer time strengths. [1]

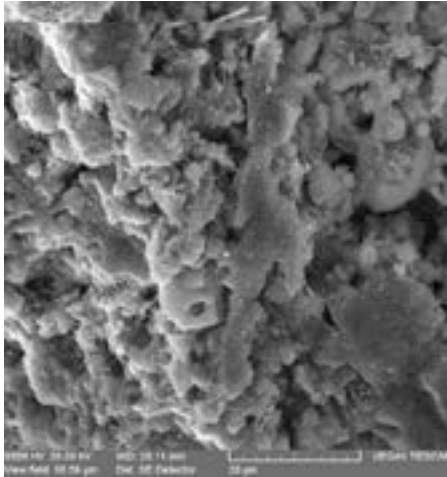
These calcium silicates form needlelike growths (Figure 1) that interconnect the aggregates and the cement molecules. All of these needles interlock with each other, and the summation of all of this interlocking force enables the concrete to be incredibly strong and rigid. Evaluating the compressive strength of a concrete sample is a way of testing the strength of these bonds. Things like heating a sample, chemically treating a sample with an acid, and altering the ratios of ingredients can affect these bonds and thus affect the final strength of the concrete.

*Equation 1*

Tricalcium silicate + Water  $\rightarrow$  Calcium silicate hydrate + Calcium hydroxide + heat  
 $2 \text{Ca}_3\text{SiO}_5 + 7 \text{H}_2\text{O} \rightarrow 3 \text{CaO} \cdot 2\text{SiO}_2 \cdot 4\text{H}_2\text{O} + 3 \text{Ca}(\text{OH})_2 + 173.6\text{kJ}$

*Equation 2*

Dicalcium silicate + Water  $\rightarrow$  Calcium silicate hydrate + Calcium hydroxide + heat  
 $2 \text{Ca}_2\text{SiO}_4 + 5 \text{H}_2\text{O} \rightarrow 3 \text{CaO} \cdot 2\text{SiO}_2 \cdot 4\text{H}_2\text{O} + \text{Ca}(\text{OH})_2 + 58.6\text{kJ}$



*Figure 1: Needlelike Growths.*

### Purpose

As stated earlier, there is a need to gain a deeper understanding of the various stresses that concrete undergoes when exposed to extreme heat, and to examine the effects of these stresses on the final compressive strength of the concrete. This need is directly demonstrated via disasters such as the Miami Florida condo collapse and the Grenfell Tower fire. Each of these incidents involved chemical and thermal stresses, with the Miami condo collapse probably being caused by water build up over several years and the Grenfell tower fire caused by a faulty fridge-freezer that caught fire, which eventually spread to the aluminum composite cladding on the outside of the building. This spreading to the composite created a chain reaction, and the entire building was quickly engulfed in flame leading to the deaths of 72 people. Incidents such as this are forcing the engineering community to reevaluate how modern buildings are constructed.

### Literature Review

As mentioned earlier, concrete is composed of tiny needlelike growths that interlock and give concrete its strength. The most important aspect of this strength is its compressive strength. Compressive strength is how much stress something can take before it fails, and concrete usually has very high compressive strength, hence its prevalent use in buildings. However, on the opposite end of the spectrum,

concrete has quite low tensile strength meaning that while concrete can support a lot of weight, it cannot move or shift very much.

The major stresses that effect the compressive strength of concrete are chemical weathering and heat stress. Each of the stresses affect the concrete differently and usually act on different time scales: chemical weathering acts over a much longer time period, whereas heat stress is associated with sudden changes in temperatures, such as fires. Since these two stresses have the most effect on concrete, I will be briefly examining the current state of knowledge related to each stress to give some context to the research in this paper.

Much of the current and past research on concrete and the effect that heat has on it is related to reinforced concrete being used in buildings. Most fires occur in the range of 300 – 800 °C so this is the temperature range that most fire related concrete research focuses on. [3] In this range, there is a significant decrease in the compressive strength of the concrete as well as cracking and, in cases of extreme temperature increase, explosions caused by rapid evaporation of water in the concrete. [4] In order to combat the effects of heat on concrete, various methods exist to model how concrete will behave when exposed to heat, and from these models heat resistant concrete mixtures have been created. [5] Concrete on its own is naturally resistant to fire, and with the addition of things such as lime and the use of calcium aluminate cement the final product is much more resistant to heat damage. [6] Since most research is being done on concrete in the average fire range mentioned above, we set out to examine more extreme temperatures, such as 1000 °C to learn more about the behavior of concrete at these relatively rare temperatures.

Concrete is a very basic material, with the main binding agent, Portland cement, having a pH of 11. This high pH means that concrete can easily react with things such as sulphates and various chlorides. All the various chemical and environmental effects that concrete undergoes can lead to several different types of deterioration such as spalling, disintegration, cracking, and alkali-aggregate reactions. Spalling occurs when pieces of the concrete break off because they are no longer attached to the main structure, and this is usually caused by corrosion or cracking of the reinforcement that is being used to add strength to the concrete. Alkali-Aggregate reactions involve various alkali elements in the concrete reacting with active silica in the various rocks and sand used in cement. This reaction produces a gel like substance that swells and breaks apart the concrete. [7]

The environment in which the concrete is being used also has a major effect on the behavior of the finished product. An example of this is concrete being used in a sewage treatment plant. In places such as this there are increased levels of sulfates which lead to decreases in both tensile and compressive strength. The sulfates penetrate the concrete and then react with the various elements in the hardened cement paste. [8] In order to further understand concrete weathering we designed an experiment to test various chemicals and their effect on the final concrete.

### Experimental Method

This first experiment was designed to test the overall relationship between increased temperature stresses and compressive strength of the sample. To prepare these samples, strict regulations were followed in accordance with the American Society for Testing and Materials (ASTM), and the recipe on the back of a bag of Quikrete 5000 was followed. Quikrete 5000 is a commercially available blend of sand, cement, and gravel that is widely used in small projects such as home patios. Each of the different regulations referred to throughout this paper, such as C31 and C192M, are specific regulations that relate to everything from the way a sample breaks to how to best prepare a sample. Samples were prepared according to ASTM's C31/C31M and C192/C192M to the ratios specified by Quikrete 5000, specifically, 433g of cement to 37g of water per sample. The samples were then cured in a fume hood uncapped for a minimum of two days, then were demolded, and then cured for an additional five days. For the purpose of statistical significance samples were prepared in three sets of three.

Samples were tested and classified in accordance with ASTM's C109/C109M and C39/C39M. The cylinders were then exposed to four different temperatures: 250, 500, 750, and 1000 degrees Celsius. Predictions were then made based off of already existing data from various sources. The samples were put into a Ziploc to contain debris and then crushed in a Carver Hydraulic Press provided by the university to determine their compressive strength. A reading was gathered from the gauge on the press, and the actual compressive strength was determined by dividing the gauge reading by the cross-sectional area of the sample. From here, the data was added to an Excel document, and averages and standard deviations were calculated. Microanalysis was performed using the university's Scanning Electron Microscope (SEM) on the rubble to determine any microstructure differences as well as examine any interesting features. Sample preparation such as sputter coating, which involves coating the outside of a sample with a thin layer of a conductive substance such as gold, was necessary to gather clear images.

The second experiment was designed to develop alternative ratios of cement, sand, stone, and water, with a final goal of creating a mix that either equaled or exceeded the standard Quikrete recipe. Samples with a ratio of 1:1:3, 1:3:1, and 1:2:1, with each number corresponding to a specific amount of either cement, sand, stone, or water. Each of these parts weighed 90g. Table 1 shows the exact amount of each ingredient in each mixture. These samples were prepared in three sets of three and cured uncapped in a fume hood for two days, then were unmolded and cured for an additional five days. Water was added incrementally to each custom recipe until a desirable texture was achieved. Samples were then prepared according to ASTM's C31/C31M and C192/C192M and tested and classified according to ASTM's C109/C109M and C39/C39M. These ASTMs related to specific methods for ensuring an evenly mixed repeatable sample as well as how to properly test aspects such as the final compressive strength of the sample. Samples underwent the same compressive strength testing as the heat-treated samples, data was recorded into an Excel data table, and averages and standard deviations were calculated.



Ratio	Cement Wt	Sand Wt	Stone Wt	Water Wt
1:1:3	90.06	90.04	270.19	35.09
1:1:3	90.06	90.04	270.19	35.09
1:1:3	90.06	90.04	270.19	35.09
1:3:1	91.03	273.04	91.09	39.03
1:3:1	91.03	273.04	91.09	39.03
1:3:1	91.03	273.04	91.09	39.03
1:2:2	91.01	181.02	181.09	36.39
1:2:2	91.01	181.02	181.09	36.39
1:2:2	91.01	181.02	181.09	36.39

*Table 1.*

A final experiment was designed to test the effects of various chemicals on the compressive strength of concrete by submerging the samples in the selected chemicals. The samples were first prepared in three sets of three according to ASTM's C31/C31M and C192/C192M, using the recommended Quikrete ratio of 433g of cement to 37g of water per sample. After chemical treatment they were tested and classified according to ASTM's C109/C109M and C39/C39M, also of note a deviation in relation to total curing time, specifically samples were cured for nine days total instead of the seven days, as in the previous two experiments. Samples were removed after soaking, rinsed using deionized water and then allowed to air dry for two days. These two drying days account for the increase in cure time. Chemicals were chosen based on our personal preferences as well as what the concrete would react with in accordance with present literature and chemistry.

The chemicals used were a generic cola for testing the effects of phosphoric acid, a generic lemon-lime soda for testing citric acid, acetic acid (commonly known as vinegar), 0.1M HCl, one sample was soaked in water, and a final sample was boiled in water. There was also a time trial element associated with this experiment; specifically, the effects of vinegar were evaluated at two days versus five days, and the effects of 0.1M HCl were evaluated at two days versus five days. After the samples were crushed, a phenolphthalein test was performed on the concrete to determine the penetration depth of the acids being used.

## **Results**

From the data generated from experiment one, we determined a direct relationship between increased heat stress and decreased compressive strength with a sharp drop in strength after 500 °C, which can be seen in Figure 2. We were also noticed interesting microstructure on the samples heated to at least 500 °C. Samples heated to between 500 and 750 °C were smooth, and instead of having needles the samples were covered in what resembled platelets as can be seen in Figure 3. The sample heated to 1000 °C was spongelike in appearance and we hypothesized that the concrete was possibly undergoing re-crystallization. Images of each temperature

can be seen in Figure 4. In samples heated to at least 500 °C there was also a change in appearance and sound when struck; specifically, the concrete produced a similar sound to a pot when struck, and the concrete took on a greenish orange tint.

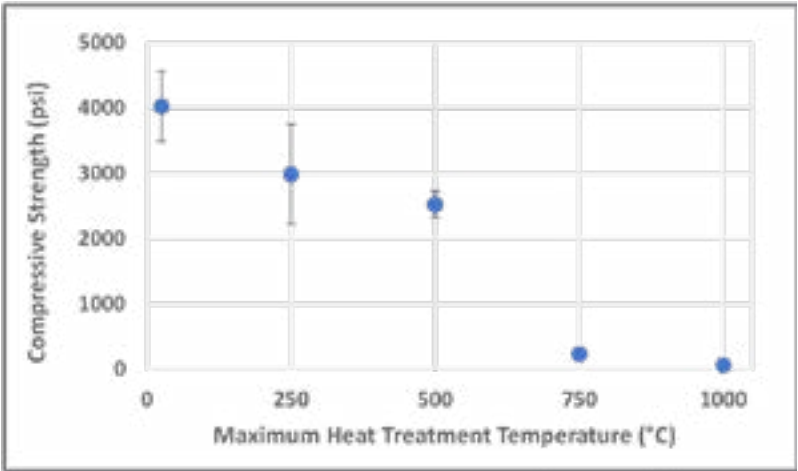


Figure 2: Strength vs Temperature.

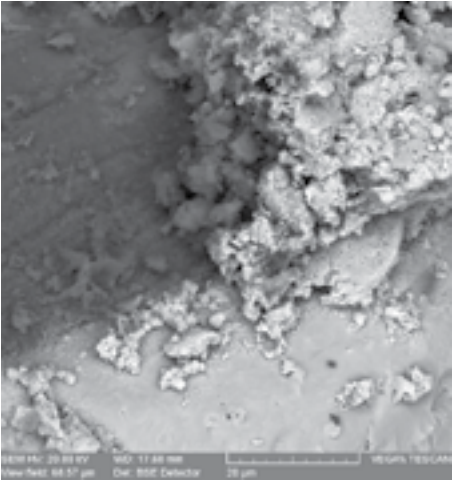


Figure 3: Smooth Platelet Covered Surface.



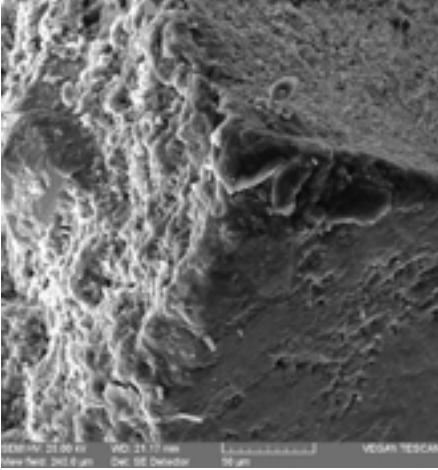


Figure 4e: Untreated Control Sample.

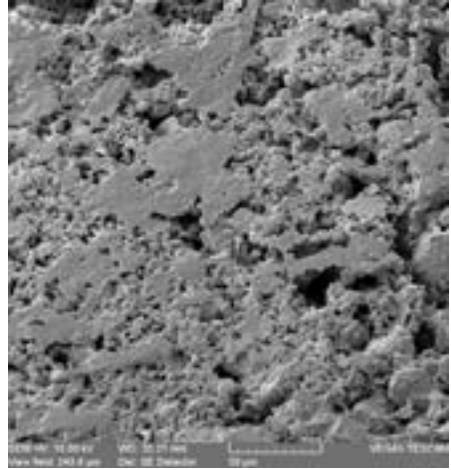


Figure 4f: 750 °C Heat Treatment.

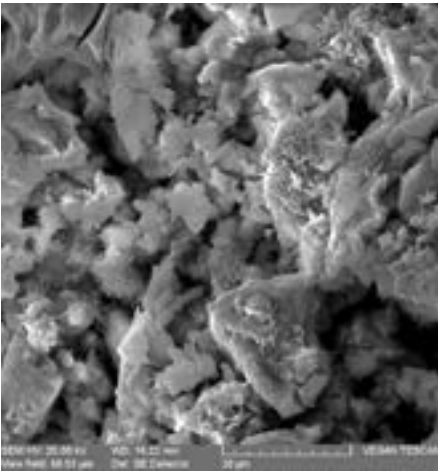


Figure 4g: Untreated Control Sample.

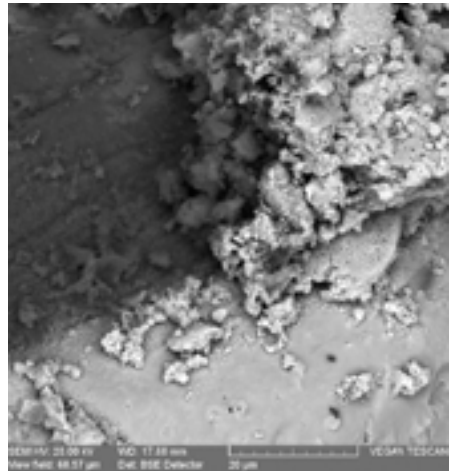


Figure 4h: 1000 °C Heat Treatment.

We were able to develop custom recipe ratios that were either equal to or stronger than the baseline Quikrete 5000 concrete recipe which involved mixing a specific amount of water to a certain amount of premixed Quikrete, in this case the mixture was one pint of water for every 13 pounds of mixture. The compressive strengths can be seen in Figure 5.

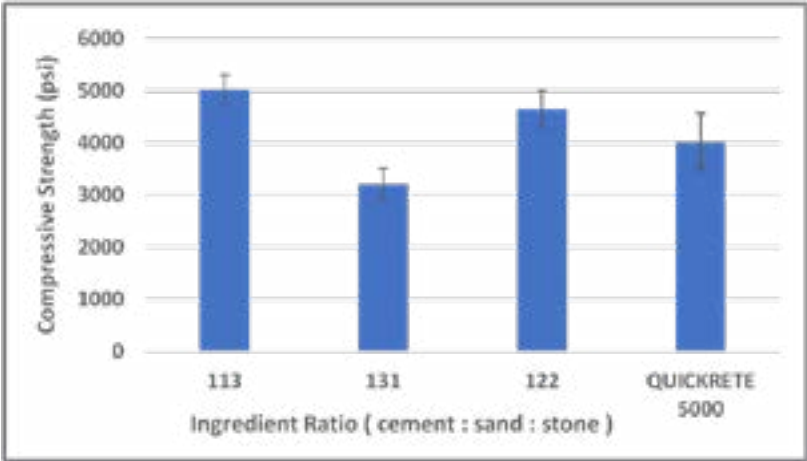


Figure 5: Compressive Strength vs Ingredient Ratio.

For chemical treatment, the results were rather disappointing. There was no penetration on the control or the samples that were soaked or boiled in water; there was a penetration of 2 mm on the sample that soaked in vinegar for five days and a penetration of 1.5 mm on the samples that soaked in vinegar for two days. The remaining cola, lemon-lime, and HCl samples all had a penetration depth of 0.1 mm. Our main conclusion from this test was that more vigorous chemicals were needed for a longer amount of time to have more measurable effects. The chemical testing can be seen in Figure 6 and an example of a phenolphthalein penetration test can be seen in Figure 7.



Figure 6: The Vinegar and HCl Samples After Soaking.



Figure 7: Results of the Phenolphthalein Penetration Test.

### Discussion

The results from the heat stress experiment are in line with what we predicted. The samples that were heated to 1000 °C behaved uniquely with the samples having a chalky feel to them and when they were crushed, they turned into dust and rock. These samples were also the hardest to sputter coat for the SEM as the samples were very dry and fragile thus any touching of the outer layer would either cause the sample to entirely fall apart or the outer layer would fall off and the sample would have to be recoated.

The results from the custom ratio experiment were more surprising purely because we did not know what was going to happen going into the experiment. A rough idea of what effect each component would have was known based on how the components react with each other though. The fact that the sample with the most sand was the weakest was not very surprising as there were few big aggregates for the cement to bond to, and the fact that the sample with the most rock was the strongest also makes sense with this logic as there were a lot of aggregate surfaces for the cement to bond to. This experiment was also more difficult than the other two in that we were working with much more hypothetical amounts compared to the other two experiments. The concrete also behaved significantly different due to alterations in the amount of sand, producing a cement that needed much more water and rock, producing a concrete that needed less water but was also harder to work with and also left more air bubbles present in the final concrete.

The chemical test experiment was by far the most surprising experiment because the results were counterintuitive. The vinegar had the greatest penetration depth whereas the 0.1M HCl had almost no penetration. The HCl was expected to have the greatest penetration and it was largely unknown how the rest of the chemicals would. There was also weird behavior during the soaking, there was a gradation present on the vinegar and HCl samples. While this gradation is in itself not unusual and you would expect it to start at the same end on each sample

however, the gradation started at different points. The acetic acid sample seemed to react from the bottom up and the HCl sample seemed to react from the top down. By far our biggest take away from the chemical testing was that more vigorous chemicals were needed for a much longer amount of time to get more conclusive results.

### **Conclusions**

The predicted relationship between increased heat stress and decreased compressive strength match the data generated and this conclusion is also backed by real world examples. The results generated from experiment two make sense from the view of how hydration works, and the products generated because we were examining the effects of the different ratios of each component on the final mixture. Finally, the results of the chemical testing were interesting but not substantial and in order to achieve better more conclusive results future research into more vigorous chemical testing is necessary.

### **Acknowledgements**

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# When it Speaks

**Kayla Haugen**

Senior, B.F.A. Studio Art: Concentration in Printmaking

**Faculty Mentor: Rachel Bruya**

## Artist Statement

I am a Minnesota-based artist who originally pursued a major in graphic design. After participating in a summer serigraphy course, I discovered the medium of printmaking and never looked back. The flexibility to adapt and change through the making of plates and the simple act of pressing materials into each other reflects my own creative process. I begin by producing an extensive amount of experimental work through printmaking processes such as monotype, dry point, serigraphy, and relief. Awarded with a variety of textures, colors, and lines as a result of these methods, I lay out the experimental work and observe how each print begins to communicate with another. The prints then inform me how to proceed, and I reveal this dialogue through layers. I build the work in several media and often seamlessly integrate print approaches with paint and sculpture.

When it Speaks is a body of work that highlights the intuitive process of collage while also recognizing the themes that fuel my art. Oftentimes, my work is motivated by an effort to understand and protest oppressive regimes. I have explored social issues surrounding gentrification, police brutality, and reproductive health. It is key to my process to immerse myself in an immense amount of research regarding these topics, as I am not always directly affected by these forms of oppression. Although my work manifests into large pieces, they are often created through fragments of experiences and information that I synthesize into cohesion. These pieces are frequently displayed as installations, and the layering of paper, ink, and alternative media are visible to my audience. My prints are physical and tactile reflections of research that embody a community of voices, including my own.

Printmaking has consistently maintained itself as a vessel for spreading information, yielding accessibility, and promoting revolutionary ideas. These distinctive attributes of printmaking as an art form are what inspire me to practice printmaking and even influence the focus of my subject matter. When it Speaks is an accumulation of work that has prompted me to question my beliefs, integrate myself deeper within my community, and inspired me to continue making sense of a seemingly senseless world.

*"Unless one lives and loves in the trenches, it is difficult to remember that the war against dehumanization is ceaseless." - Audre Lorde*



*Untitled*

2021

Paper, ink, acrylic paint on panel.

19" x 24"



***Plug and Play Pink***

2021

Paper, ink, acrylic paint. Installation.  
Dimensions variable.



*Outside Voice Inside*  
2021  
Ink, Paper, Acrylic Paint. Installation.  
Dimensions variable.



***Minneapolis Reclaimed by The People***

2021

Paper, ink, acrylic paint, pastel, cardboard.

Dimensions variable.

# Scents and Memories

**Emma Ozark<sup>1</sup>**

Senior, B.F.A. Studio Art: Comics Concentration

**Faculty Mentor: Mary Climes**

## Artist Statement

Through a combination of animation, comics, and book art, I preserve and reclaim a unique practice of storytelling. This is a practice of synthesizing digital and traditional works together, which the gentrification of the internet and monopolization of animation has been trying to kill for the sake of profit.

My artistic practice is a blend of digital and traditional. Computer animation and digital art often diminish the impact of traditional works through instant gratification. While I aspire to use analog animation, it is not feasible for a single animator to complete alone. A mix of traditional and digital art can help me complete my projects faster, while retaining handcrafted qualities. Furthermore, I utilize the juxtaposition of digital imagery and stop motion as a layer in the narrative. In *Battle to the Deaf*, reality—my brother and I as people—are drawn as distinctly digital, pixelated cartoons; the virtual world is stop-motion animated with our video game avatars built with actual materials in the “real” world.

The term “book” is used to speak to a collection of sequential images that explore how the reader can interact with the book as a sculptural object, as with *Tall Bike*. Books can diverge from the traditional notion of a bound book, such as live readings, or a recorded telling of the story. In my work, this divergence exists via my concept of an animated book. I display pages composed of projected stop-motion animated panels, still images and drawings, and pages built of dimensional diorama panels containing sculpted scenes with clay characters. My “animated books” have an ephemeral quality to them unlike regular books which can be easily reprinted and copied. Animated works can only be truly experienced through interaction and projection, creating a unique copy, or through a website on the internet, which could easily be lost or broken. It highlights the fragility of the internet and animated medium that is often taken for granted.

*Scents* explores these possibilities. It is a draft for a larger story that explores the contradiction in our supposedly-free capitalistic society. The plot centers people from various backgrounds all coping with the precarious technological hyper-individualized dystopia. Each character is compartmentalized within small quarters of the story while visually mimicking the compartmentalization of comic panels. The framing of the narrative forces the viewer to recognize their role through a mix of third, first, and second person. Animated elements demonstrate a desire to break the boundaries imposed on the characters’ lives figuratively and literally as movement alters the structure of the page. Stop-motion animation gives a soulful, tactile quality while digital media stitches the work together, reflecting the subtle but inescapable effects of technology on our lives. The merging of stop motion and comics creates an intimacy between human touch and direct communication; stop motion’s textual

<sup>1</sup> Emma is a member of the Honors College of UW-Stout (Ed.).

and handmade qualities emphasize a connection usually lost in computer animation. Comics similarly foster a close bond with a reader. I synthesize these mediums to craft a multimedia narrative which reinvigorates modes of expression and connection beyond just entertainment.

These pieces are explorations for larger narratives in which I continue to examine themes of memory and the simultaneous intimacy and alienation we experience in our lives through forced labor and exploitation under capitalism. I encourage viewers to transcend boundaries and consider a future other than what is marketable. My practice comes from a need to express the deep pain, rage, and lethargy inflicted upon us from the devastating events that occur constantly: the pandemic, the fascistic state of America, the technological dystopia, and climate change, to name a few. Animation is often associated with positive children's media, though it can also offer nuanced emotional insight into these events through movement and textures that live-action film cannot. I offer a window to directly experience a literal manifestation of this surreal reality we live in with a non-satirical sense of humor, as satire offers no solution. What I express is merely an exaggerated extension of reality. Part of me wants to escape this reality, but another part wants to design a solution, a future that is habitable and hopeful. My work is not about the doom of our situation, but the kind of future we can have beyond capitalism.



**Scents (Page one of three)**

2021

Stop motion animated comic. Sculpey, plasticine, cloth, duct tape, acrylic paint over wire, tinfoil base on sets made of cotton, cardboard, cardstock.

Dimensions variable.

<https://emzark.com/Scents-Pg-one>





***Battle to The Deaf (Page One)***

2020

Interactive animated comic. Sculpey, plasticine, acrylic paint over wire and tin foil base, shot on sets made of acrylic paint, cardboard.

7.7" x 7.2"

<https://emzark.com/BTTD-P1>



***Tall Bike (Pages 4-7)***

2021

Laser printed artist book.

8 pages, edition of 35.

4.25" x 2.75"



**Tall Bike (Pages 4-7)**

2021

Laser printed artist book.

8 pages, edition of 35.

4.25" x 11"

# Effeminate

**Katie Reeves<sup>1</sup>**

Senior, B.F.A. Studio Art: Ceramics Graduate

**Faculty Mentors: Kate Maury and Geoffrey Wheeler**

## Artist Statement

I make functional ceramicware that focuses on the themes of sexuality, femininity, intimacy, and classicality. Using porcelain as a clay body, and the addition of sprigs and slip trailing, I create work that is feminine and delicate, while simultaneously being bold and sassy. Ergonomics is very prevalent in my body of work. I focus on making work that is comfortable in the hand and on the mouth. My work emphasizes the moments of contact between the user and the object.

My sexuality plays a large role in what I make. As a lesbian, I am very attracted to femininity. While I do not adhere to the ideas of femininity in the way that I dress or identify, it is incredibly visually appealing to me. As a feminist, I used to reject femininity altogether. To me, femininity was rooted in patriarchy and oppression, and was essentially being defined and controlled by men. I wanted nothing to do with it, but through my recent body of work, I have been able to reclaim femininity. Through feminism, femininity can mean whatever I want it to mean. To me, it means comfort, power, beauty, delicacy, and sensuality. Having reclaimed femininity and being able to define it myself has made me fall in love with it. I have also gained a new appreciation for the color pink, which I also used to reject. I now dye some of my porcelain pink because I enjoy the suppleness and softness of the color. This entire process has also helped me fully accept my sexuality. Being attracted to the female form means that I reference it a lot in my forms. I use soft yet voluptuous curves in my work, making direct references to the female form. In terms of glaze, I use glazes that move during the firing process. The way that the glaze cascades down the curves of the form is something that I am very interested in. I enjoy the materiality and fluidity of the glaze and how juicy and delectable they can look on the form. This emphasizes the sensuality of my pieces and draws attention to each curve. I enjoy how corporeal pots are in general. They have hips, bellies, lips, and a foot.

Because of this, I personify all my pots. They have very clear personalities and voices to me.

I am interested in the intimate moments that happen when someone uses my work, such as how the piece feels in the hand and on the mouth. Every aspect of my functional work is intended to make the user experience and appreciate the curves and textures of my pieces. I attach sprigs on the lips of my cups and mugs; this sprig goes in the mouth when the user takes a drink out of the vessel. The textures of the sprig are then felt on the tongue. It is an incredibly sensual experience. There are many textures for the hands to explore on each piece of my work. I want viewers to be drawn to touch my work. The suppleness of the curves and the textures of the slip

trailing are meant to invite the viewer to run their fingers along each piece. I enjoy watching the user interact with the piece as they discover each and every texture.

My work makes direct references to antiquity, specifically Baroque and Rococo ornamentation. The detailing that I add to my work, using sprigs and slips, reference antique metalware from these time periods. I am drawn to the intricate and extravagant detailing on old metalware, such as that in antique frames, silverware, and furniture. I enjoy the flamboyant and unconstrained qualities of these items. Using slip detailing, I create intricate designs that mimic many of these patterns. I am drawn to the swirl designs, as well as the symmetrical qualities of this classical ornamentation. I enjoy the combinations of decorative embellishments and use many of these qualities in my functionalware. These techniques give them a classical and elegant look.



**Curtis**

Fall 2021

Porcelain, Cone 6 glaze, Gold Luster.



***Harold***

Fall 2021

Porcelain, Cone 6 glaze.



**Thomas**  
Fall 2021  
Porcelain, Cone 6 glaze, Gold Luster.





***Daniel***

Fall 2021

Porcelain, Cone 6 glaze.



# Translative of

**Beck Slack**

Senior, B.F.A. Studio Art: Photography

**Faculty Mentor: Brandon Cramm**

**Artist Statement**

The installations that this work sits within generate a space where one can witness and reflect upon the uncanny particulars that subvert one's daily physical experience. This subversion is linked to the feeling of the sublime—an aesthetic or spiritual realization of something greater and beyond oneself. However, my installations do not point upwards towards the heavens. Rather, they point within, directing attention to inhabited systems. Through the use of sculpture, new media, and poetry, my works bring attention to what lies beyond one's typically perceived domain - whether that be heavenly bodies or earthly shadows. I desire the viewer to pay attention to an object or image's history in order to acknowledge a connection between it, themselves, and their relationship to a greater system or entity. This pan-conscious relationship (shared between human and object) opens the door to a feeling much stranger—in irreducible entity outside of oneself, an abstract and unbearable multiplicity of overlapping experience.

History becomes recorded, traced, and consumed—infinately. I play with a singular object's identity repeatedly over the course of many pieces to funnel a notion of the perdurant. This perdurancy points towards how forms endure within our minds, multi-dimensionally, and through time (if those are to be separated). I suspend the idea of the object into a moment of infinite regress, where one can re-encounter said object in states of synthesis as it forms tunnels into itself over time. This reveals their nature to be temporally fragmented by (systems) weathering, illuminating, continued past being as it, object of singular identity to object of **You**, revealing **being** as relational. Our curiosity confronts, enabling holistic existential systems between I and You. Henceforth, objects radiate a spatial emanation beyond what they inhabit. As we find ourselves caught within this, our perception develops something liminal, something in-between our conscious comprehensions.



***Uninhabited Drift (Original Copy)***

2021

Thermal paper, steel.

5' x 7' x 1' (Approximate)



***That (Master Copy)***

2021

Digital collage of chemigram images.

27" x 18"



*That (Scanned)*  
2021  
Digital scan.  
4.5" x 11.75"



***That (Filmed)***

2021

Video.

Infinite loop.

